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ABSTRACT

A specific skill necessary to expand vocabulary is that of acquiring additional meanings for words that have common, already known meanings. A study was conducted to determine if presenting subjects with the known meaning of a word before requiring them to learn a new meaning for it would result in a learning detriment. The study used homonyms whose common meanings were known and whose uncommon meanings were unknown to 40 grade 2 and 40 grade 6 children who were placed in four treatment groups, in which either (1) both the known and to-be-learned meanings of the words were presented; or (2) only the to-be-learned meaning was presented; either (3) with; or (4) without a picture illustrating the to-be-learned meaning. A posttest on the to-be-learned meanings was given to each child immediately after the reading of the text, after which three Piagetian classification tasks were administered. A follow-up test was administered to all children a week later. The results supported the view that some reading comprehension problems may stem from a reader's inability or unwillingness to discard a schema when passage context indicates that it has become inappropriate. This may be due either to the inability to use context, or to ignoring clues that should signal a shift in meaning. It appears that this aspect of acquiring meaning may be developmentally influenced, since second and sixth grade children performed differently both in reading and on the classification tasks. (FL)

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COMPREHENSION DEFICITS FROM INABILITY TO SHIFT SCHEMATA: INTERFERENCE OF EXISTING KNOWLEDGE ON ACQUIRING NEW KNOWLEDGE FROM TEXT

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INTRODUCTION

Vocabulary knowledge is highly related to both reading ability and academic success. Harris and Sipay (1975) note that a vocabulary subtest is included in most individual intelligence tests, and that vocabulary score usually correlates more highly with total IQ score than does any other subtest. Further, vocabulary seems to be an important indicator of general learning ability, academic growth, and success in reading.

A specific skill necessary to expand one's vocabulary is that of acquiring additional meanings for words which have common, already known meanings. An example of such a word is scale, which has a variety of subject-specific meanings--in music: tonal scale; in general science: weigh scale; in woodwork: scale model; in biology: fish scale. Acquiring subject-specific meanings is vitally important in school, and is an aspect of meaning acquisition and reading instruction which is often unstressed. The study of multiple meaning acquisition can provide valuable insights into the structure of the internal lexicon, and has important implications for schema theory in reading comprehension.

BACKGROUND

Schema-theoretic views of reading imply that reading comprehension difficulties beyond decoding problems result from one or more of the following factors: (1) not having the appropriate schema; (2) not

assessing the appropriate schema; and/or (3) not shifting or discarding a schema when it becomes inappropriate (Bransford & Johnson, 1973; Anderson, Reynolds, Schallert & Goetz, 1977; Adams & Collins, 1979). This study was designed to examine the third of the above factors. That is, the study examined the possibility that some readers become "schema-bound" and do not discard a previously accessed schema when passage context indicates that such a strategy should be followed. Such behavior has been previously noted, though not directly studied, by Mason, Kniseley, and Kendall (1979).

This study posited that presenting the known meaning (i.e., triggering an existing schema) before requiring students to learn a new meaning for words which have identical graphic and phonological forms across meanings (i.e., homonyms) would result in learning detriments. Yet, this is the manner in which teachers and reading workbooks often attempt to teach new meanings for homonyms, where students are told "You know the xxx meaning for this word, but it can also mean yyy."

The study used homonyms whose common meanings were known, and whose uncommon meanings were unknown to 40 students in each of the grades 2 and 6. In continuous text passages, four presentation methods were used to teach the unknown meanings: either (1) both the known and to-be-learned meanings were presented, or (2) only the to-be-learned meaning was presented, either (3) with or (4) without a picture illustrating the to-be-learned meaning. A sample passage follows:

Condition 1: The boy picked up the rope. He wanted to practice tying different kinds of knots. The rope was stiff and hard to handle. He hoped he would not have to cut the rope because he wanted to use it to make a trap.

The boy wanted to catch a knot. There were many knots in the shallow water at the lake. They were there to feed at the edge of the water. The boy wanted to catch the one with the pretty feathers. He knew it would not be easy because the birds were smart.

The boy was happy. He was able to go to the lake right away.

In condition (2), where only the to-be-learned meaning was presented, the first paragraph of each text was constructed so that the known meaning of the homonym was not triggered before the to-be-learned meaning was encountered:

Condition 2: The boy picked up the rope. He had trouble straightening it out. The rope was stiff and hard to handle. He hoped he would not have to cut the rope because he wanted to use it to make a trap.

Continued as for condition (1).

Texts were constructed so that the to-be-learned meaning was presented in terms of attributes which described the unknown concept, which were then reinforced by the definitional term. In the above example, "feed" is given, then "feathers," then the definitional term "bird." Additionally, each sentence in the paragraph containing the to-be-learned meaning was constructed to give increasingly stronger indications that the previously triggered meaning of "knot" was to be discarded in favor of a new one.

Two additional aspects were examined in the study: ability to use context to disambiguate a word's meaning, and ability to cross-classify, i.e., ability to perceive multiple class membership. Ability to use context was determined by a pretest. Ability to cross-classify was thought important because of the importance of classification/categorization to meaning acquisition. Further, it was posited that the Piagetian stage

encompassing multiple class membership related strongly to acquisition of multiple word meaning vocabulary. That is, realizing that a bead in a Piagetian classification task can be thought of as being either brown or wooden might relate to realizing that a word which does not change in either spelling or pronounciation can be thought of in different senses. Ability to cross-classify was determined by administering three Piagetian classification tasks to all subjects.

METHOD

To determine those who knew only the primary meanings of five homonyms, 160 students (80 in each of grades 2 and 6) were pretested. Of the 98 students found, 40 from each grade were randomly assigned to one of the four treatments noted above (10 students per treatment per grade). After reading the texts appropriate to the experimental group, students were given a multiple choice post test to determine how well the unknown meanings had been learned. Students had previously been told they were to try to learn a new meaning for a word they already knew, and also that they would be tested to see if they had learned the new meaning after reading the texts. It was stressed that the to-be-learned meanings were real meanings, though they might seem strange. Decoding differences were controlled.

A post test on the to-be-learned meanings was given to each student immediately after reading the texts, after which three Piagetian classification tasks were administered. One week after the post test, a follow-up test was given to all 160 students who were originally examined. This allowed a measure of retention over time, and also provided a

comparison of students who were and were not involved in the experiment to ensure that gains were due to treatments rather than to extraneous factors.

The central research questions examined in this study were:

1. Students reading texts which do not necessitate discarding an existing schema before acquiring a new schema for a homonym will learn more new meanings than students who do need to discard an existing schema.

2. Students reading texts which include a picture-clue, and which do not necessitate discarding a schema will learn more new meanings than students in the other treatment groups.

3. Students reading texts without a picture-clue, and which necessitate the discarding of an existing schema before learning a new meaning for a homonym, will learn fewer meanings than students in the other treatment groups.

4. Students receiving a picture-clue will learn more meanings than students who do not receive a picture clue.

Exploratory questions regarding the relationship between learning the new meanings and the students' ability to use context and cross-classification abilities, within and across grades, were also asked.

FINDINGS

The central questions were analyzed through ANOVA using planned comparisons within grade levels. Each family of contrasts was tested at 0.05 alpha using Dunn's procedure. Exploratory questions were analyzed using Kendall's Tau procedure, and Chi-square as appropriate. Mean scores and standard deviations by grade and treatment group appear in Table 1. Table 2 shows the results of the analysis testing the four main questions.

*** Tables 1 and 2 here ***

The results indicate that students in grades 2 and 6 performed differently. Research hypotheses 1 and 2 are supported for grade 2 but not for grade 6. Second graders learned significantly fewer meanings when they were presented with texts including both the known and unknown meanings, indicating that they may have had difficulty shifting from the previously known schema when it became inappropriate. This was not the case for the sixth graders.

This result may be explained through differences in second and sixth graders' ability to use context and to classify. According to chi-square analyses, sixth graders were significantly better in both areas. Across treatment groups within grades, there was no difference in ability to classify or use context, since students had been randomly assigned to experimental groups. Research hypothesis 3 is supported across both grades.

Research hypothesis 4 cannot be supported for either grade. The use of pictures to illustrate the unknown meaning made no difference at either grade level, although the follow-up test (given after a one week delay) showed that second graders who received picture-clues retained the to-be-learned meanings significantly better than students who did not receive a picture-clue. Additionally, the follow-up test showed a significant difference between students who were and were not involved in the experiment, indicating that the meanings were learned through the treatments rather than through other factors.

CONCLUSIONS

The results support the view that some reading comprehension problems may stem from a reader's inability or unwillingness to discard a schema when passage context indicates that it has become inappropriate. This may be due to either inability to use context or, as Mason et al. (1979) speculated, to ignoring context clues which should trigger such a shift. Further, it appears that this aspect of acquiring meaning from text may be developmentally influenced, since second and sixth graders performed differently both in reading the texts and on the cognitive classification tasks. Thus, as students acquire the cognitive ability to perceive multiple class membership, and as they gain in ability to use context, it seems that discarding and/or shifting schemata becomes easier.

The results of this study support models of the lexicon and of semantic memory that advocate separate storage and retrieval of word meanings regardless of commonalities in the word's surface graphic and phonological representation across meanings (Kintsch, 1977; Rubenstein, Lewis & Rubenstein, 1971). For instruction, the results would support presenting multiple meanings of words (e.g., subject-specific vocabulary) as separately as possible from the already known meaning, especially for those students who have not reached the multiple class membership stage of cognition. Specific references to the known meaning, which would trigger a schema and reinforce an existing memory trace, might well result in learning detriments for young students attempting to learn new meanings for homonyms. Additionally, the results imply that schemata are differently accessed and controlled by children at different cognitive developmental stages.

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Table 1

Means and Standard Deviations of the
Four Treatment Conditions by Grade

	Group 1	Group 2	Group 3	Group 4
$\bar{X}$ (grade 2) N= 40	1.60	2.90	2.60	4.10
S.D.(grade 2)	1.84	1.52	2.12	0.99
$\bar{X}$ (grade 6) N= 40	2.80	4.00	4.00	4.60
S.D.(grade 6)	1.87	1.63	1.56	0.97

Table 2

Results of the Planned
Comparisons by Grade Level

	Contrast 1 (schema shift vs. no schema shift)	Contrast 2 (no schema shift + picture vs. others)	Contrast 3 (schema shift, no picture vs. others)	Contrast 4 (picture vs. no picture)
t (grade 2)	-2.65*	2.84*	-2.62*	-2.08
t (grade 6)	-1.84	1.77	-2.48*	-1.84

*Significant at 0.05 alpha per family;
Critical value (conservative) for 1-tailed test
(Dunn 2 contrasts, 30df); t= 2.36.

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